Valley Regional Fire Authority

Training Manual

Date of Issue: 11/2011

Reference: www.holmatro-usa.com .
(Note: Some technical information is not available for older models. New model information is referenced which have the same capabilities as older models.)

VRFA Task sheets: Power tool weekly check (17-1.0); Holmatro startup (17-7.0)

HOLMATRO RESCUE TOOL

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INTRODUCTION

The Holmatro Rescue Tool is a hydraulically powered device used primarily for vehicle extrications and can be used in heavy rescue applications. It is capable of developing thousands of pounds of pressure to spread, cut, pull or lift to effect a rescue operation.

Presently, the Valley Regional Fire Authority uses one brand of hydraulic rescue tool manufactured by Holmatro® Rescue Tools.

I. HOLMATRO RESCUE TOOL

The Holmatro Rescue Tool carried by engine companies consists of:

A. **Power Unit -** Two models with different specifications are depicted on Pages 3, 4 and 5

Both units are powered by 4 cycle, air cooled Honda engines and use a positive displacement pump to draw and pressurize hydraulic fluid from the reservoir, direct the fluid through the hose and finally through the tool.

Both power units utilize a two-stage pump design capable of producing 10,500 psi. Initial extrication operations will only require use of the first stage pump, which is near 3,000 psi. When an operation requires stronger tool forces, the second stage will *"kick in"* which can increase the hydraulic pressure up to 10,500 psi. This "change over" to the second stage can be recognized by a momentary "stalling" of movement of the tool followed by a continued movement in the direction selected.

Note: Members using the tools need to keep the trigger handle in the desired position during the "change over" phase to utilize the second stage of the pump. If the trigger handle is released at that time, the pump will go back to the first stage pressures and will take time to rebuild to activate the second stage.

The fluid used in both pumps is a 22-weight mineral based hydraulic fluid that is pale or light yellow in color and is non-corrosive. Because the hydraulic fluid is the "life blood" of the system, special care shall be given in assuring the proper level and cleanliness of the fluid is maintained.

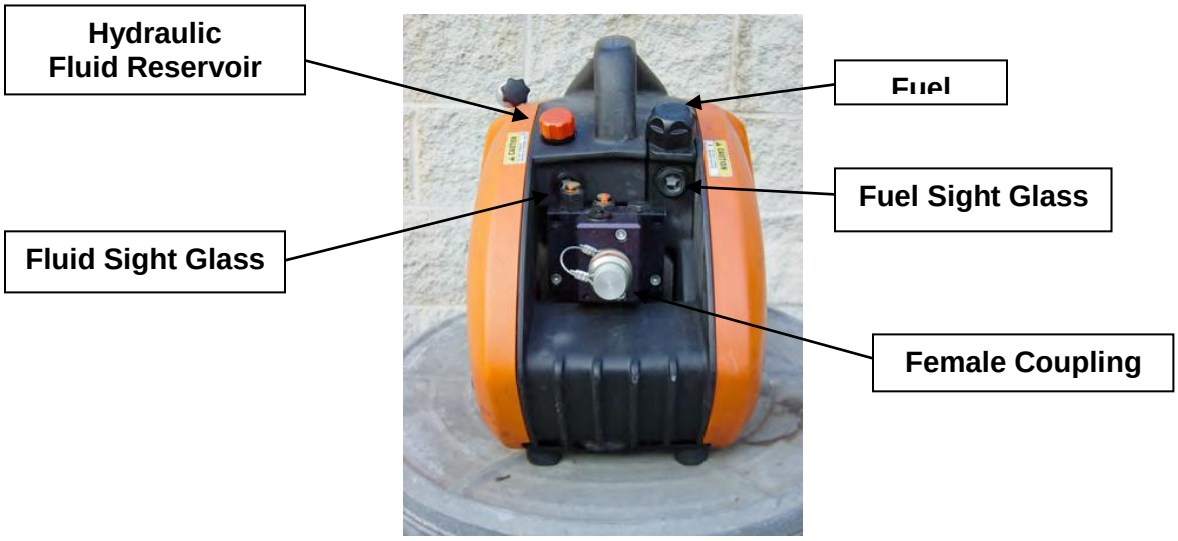
PPU 15

- 35 lbs.
- 2.5 horsepower Honda engine
- 4500 rpm (set at factory)
- 1.3 quarts regular unleaded gasoline
- 2000 cc usable hydraulic fluid
- Single tool operation

DPU 30

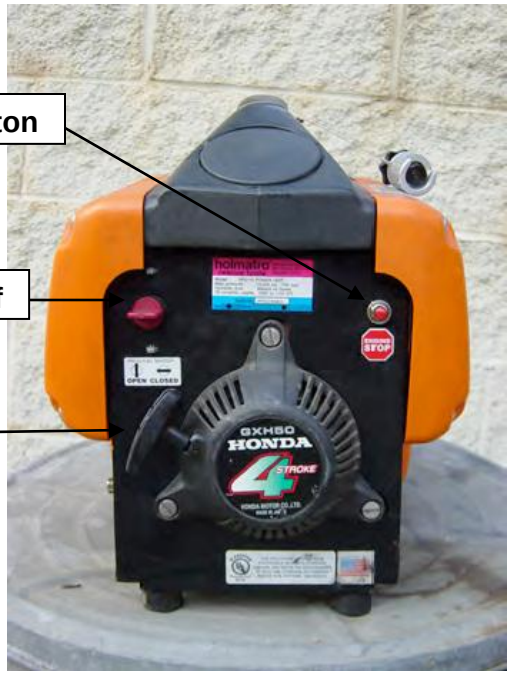
- 58 lbs.
- 3 horsepower Honda engine (GX100)
- 3600 rpm (set at factory)
- 1.5 quarts regular unleaded gasoline
- 3000 cc usable hydraulic fluid
- Dual pump for simultaneous tool use

Photo #1



PPU15 Front View

Photo #2



PPU15 Rear View

Photo #3

PPU15 Top View

Photo #4

DPU30 Front View

Photo #5

DPU30 Rear view

B. SPREADERS

There is currently one spreader unit used on the engine companies. It is model 4242 UL. One member operates the spreader by use of the trigger handle.

The trigger handle is of the “dead man” design which when rotated clockwise, causes the spreader to open. A rotation in the counterclockwise direction will cause the tool to close. When released from either position, spring tension will cause the trigger to return to the neutral position and movement of the tool will cease.

A built-in check valve will keep the tool in its current position when the trigger handle is released while under load in either direction. Even when the pump is shut down or the spreader is disconnected from the hoses, a movement of the trigger handle in either direction will not cause the tool to release the load.

4242

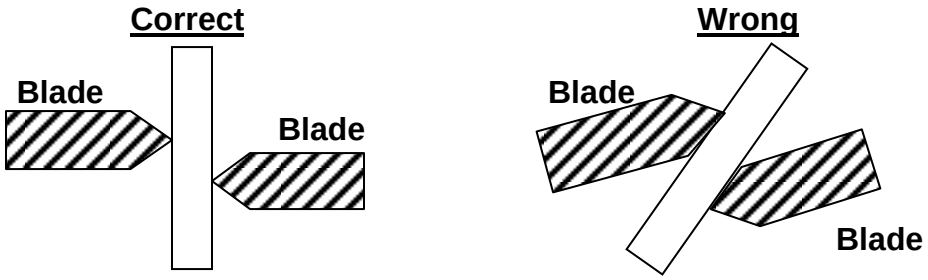
- 19,595 lbs. Max. spreading force (back of tips)
- 12,925 lbs. Max. spreading force (front of tips)
- 11,200 lbs. Max. pulling force
- 27 ¼" Max. travel distance
- 39 lbs weight

4242 Spreader

C. CUTTERS

All cutters also utilize the "dead man" trigger handle design. When the trigger is rotated in the clockwise direction, the cutter blades will open and when rotated counterclockwise, the blades will close.

Note: Because of the powerful force employed while cutting with the Holmatro cutters, extreme care should be used to ensure that the tips of the cutters ***DO NOT*** cross over on the opposite side of the blades. Care should also twist and allow the blades to separate while cutting. Both scenarios are referred to as "side loading" can cause damage to the cutter blades as well as other components of the cutter unit.



The Holmatro cutters currently being used by the VRFA have been upgraded from their previous use as Combi Tool (Model 3150). The straight arm blades were replaced for more tradition scissor style blades for better cutting capability.

3150 (Ref: 4035)

- 57,320 lbs. Max. cutting force (in notch)
- 5 11/16” Max. opening at tips
- 31lbs. weight

3150 Cutter

D. TELESCOPIC RAM

The ram utilize the same trigger handle mechanism as the previously mentioned tools. Rotating the handle in the clockwise direction will cause the ram to extend. Rotating the handle in the counterclockwise direction will retract the ram.

The ram is of the two-stage design whereas there is a plunger within a plunger that extends from the main body of the tool. The ram extends from the end nearest the handle.

There is no provision for the use of the telescopic rams for a pulling operation.

3350 (Ref: 4350)

- 21” retracted to 50 ¼” fully extended
- 49,145 lbs. Max. spreading force - 1st stage
- 18,210 lbs. Max. spreading force - 2nd stage
- 15 ¼” Spreading Travel - 1st Stage
- 14” Spreading Travel – 2nd Stage
- 36 1/2 lbs. weight

3350 Telescopic Ram

Ram fully extended

HRS 22

Each engine company also carries an HRS 22 Ram Support that can be used in conjunction with the telescopic rams.

The main use for the ram support is two-fold. First, it provides a purchase point nearer to the object to be pushed when, for instance, a dashboard needs to be moved away from a patient. And secondly, it helps to spread the force load against an object, giving the ram end a wider and more stable purchase point. Although the design of the ram support is to use the smooth round cross braces, the hex shaped braces are equally as strong. See photos below

HRS22 Ram Support

HRS22 used in dash push

E. HOSES

The hoses supplied with the Holmatro rescue tool come in three colors, orange, black and blue which are 32’ in length. In addition the Ladder truck has a 100’ hose reel located on the front of the apparatus for longer deployments when needed. The design of these hoses is unique to the fire service to where the inner, high pressure (supply) hose is encapsulated and protected by the outer, low pressure (return) hose. Both inner and outer hose are constructed of polyurethane and reinforced with Kevlar-like Aramid fibers, which make them resistant to kinking. There are bend restrictors at each end of the hose, which provide protection where the fitting and the hose meet. The working pressure of the hose is 10,500 psi with a burst pressure rating of 4 times that or 42,000 psi. See photo previous page.

32’ Hand lines

Connecting hose to tool

F. COUPLERS

All Holmatro hydraulic hoses and rescue tools come standard with flat faced, no-drip, auto locking, quick couplers. These couplers have a built in automatic return valve that eliminates the need for a dump valve on the pump and allows the *“hot swapping”* of tools. Each coupler, male and female, has a protective cap designed to keep out dirt as well as protect the coupler from damage when not in use. Special care should be taken to ensure that couplers as well as the caps are thoroughly cleaned before storage to keep dirt and other contaminants from entering the hydraulic system. See photo above.

G. PRESSURE RELIEF DEVICE

Each motor/pump unit comes with a pressure relief device that is to be used to relieve built up pressure in the hoses and tools. The device is used by placing the male end of the hose coupler in the open end of the device and turning the black knob clockwise until the plunger in the male coupler is depressed and a small amount of fluid is released. The hoses and tools can become pressurized when the tools are operated to their fully opened or closed position and then the trigger handle released. See photos below.

To avoid the inadvertent build-up of pressure in the tools and hoses, store the tools as follows:

Spreader – Close until tips touch, then open one-quarter inch (1/4”)

Cutters – Open or close blades until tips cross. If the cutter will not fit in the compartment this way, open completely, then close slightly.

Rams – Fully retract piston, then open one quarter inch (1/4”)

Male coupler w/ dust cap

Pressure Relief Device in use

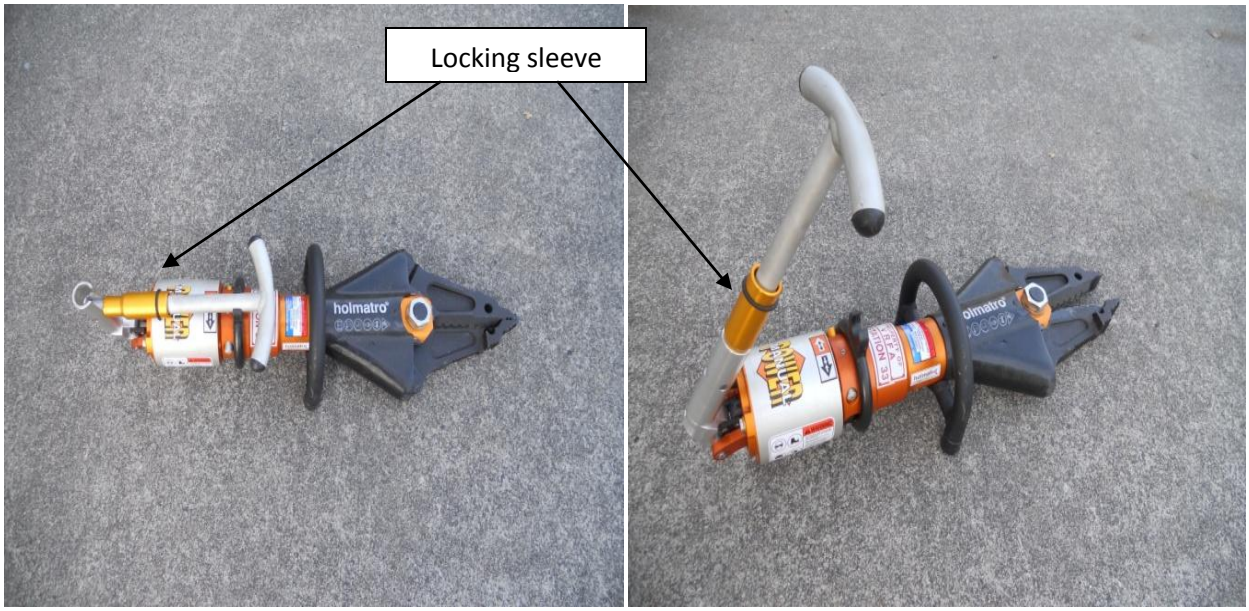
H. HAND OPERATED HOLMATRO

Reserve engines have been outfitted with hand operated combi Holmatro tools. These tools are a double action hydraulic tool powered by manual operation. The tools have the ability to either spread or cut depending on the operation. The benefit of these tools include: portability, ability to use in confined spaces, and operated without the need of a power unit.

3120 HCT

- 18,660 lbs. Max. cutting force (center of blades)
- 11,690 lbs. Max. spreading force (back of tips)
- 6,590 lbs. pulling force
- 10 ½ inches spreading distance
- 23 lbs Weight

Note: As stated in the previous cutter section, avoid side loading of blades which can cause significant damage to the tool or possible injury to firefighters. Do not allow tools to twist around making them parallel to the object being cut. Reposition the tool and resume cutting.



Stored position **Ready for operation**

Operation:

- Remove pump handle from storage bracket.
- Pull up on pump handle ensuring locking sleeve engages with pump main body.
- Select type of operation (opening or closing) by moving the control pin accordingly.
- Small arrows (located within the large arrow) indicates the operation being performed.

II. MAINTENANCE AND PERIODIC CHECKS

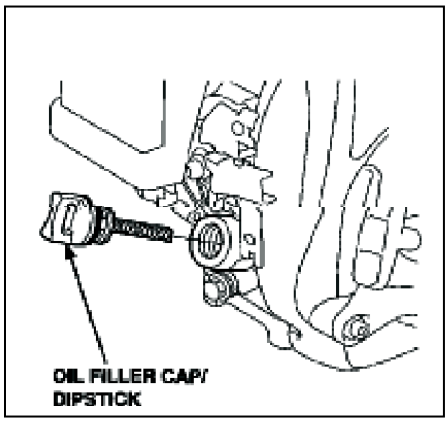
A. Power Units

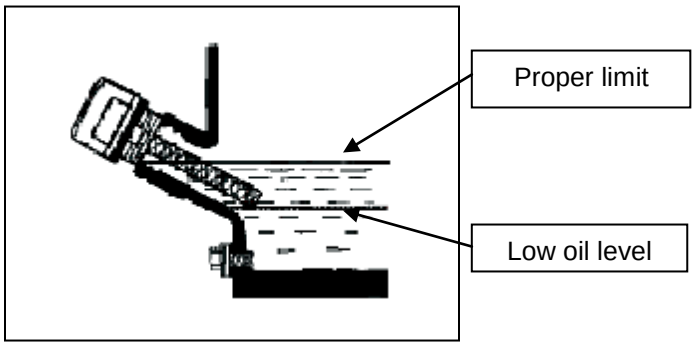
Daily maintenance of the Holmatro power units consists of checking the fuel and hydraulic levels, on/off switch (DPU30) in the on position, choke in the proper position, fuel valve on, as well as a complete visual inspection of the power unit to ensure its readiness.

On a weekly basis, the power unit should be removed from the compartment and engine oil and other fluids checked. Visually inspect that all fasteners are present and tight. The unit should be started and run for at least 10 minutes to ensure a smooth operation. While the power unit is running, connect a section of hose with a hand tool, operate the tool to its full open or closed position and continue to hold the trigger handle for a few seconds. Note the change in RPM before releasing the handle. This ensures that the second stage pump is operating and that the high pressure load will not stall the engine. Repeat this action in the opposite direction. (For DPU 30 only) Turn off the fuel valve and allow the unit to run out of fuel to complete shut down. Return the tool to its ready position.

<u>Low Oil Cutout in Holmatro Power Unit</u>

Tests on Holmatro power units currently used by the V.R.F.A. have exposed potential problems during emergency service. Each unit is equipped with a low-oil alert system which will automatically stop the engine when low oil is detected. This cut-out device stops the engine when the unit is tilted from level ground 15º to 40º in any direction, or if levels fall below the upper limit in the reservoir.





According to the Honda engine service manual, oil level checks on this unit are to be done by placing the dipstick into the filler neck but not screwing the dipstick into the housing. The oil reservoir is very small (½ pint). The difference between screwing the dipstick into the housing, or not, is enough to make the operator believe the oil level is in the proper range, when actually it is in the low oil range that can trigger an unexpected shutdown of the tool!

Firefighters should ensure that the oil level is kept at the top of the filler neck at all times to prevent accidental low oil cutout during extrication operations!

B. SPREADERS

The daily check for the spreader unit is to ensure that the unit is ready for use and the dust cap is in place.

For the weekly check, a good overall visual inspection checking for loose and/or missing fasteners and that the trigger handle operates freely and returns to the neutral position when released. The tool should be connected to the pump, cycled at least one time and inspected for leaks and for any debris near the yoke area. Check for cracks or gouges in the arms and for any cracks or deformities in the main body of the tool. Also, the operation of the spring loaded, quick pins for the tips should be checked by depressing the pins and removing the tip. Pins should move freely in both directions. The tips should be inspected for cracks and excessive wear and should be replaced if either of these two conditions exists.

C. CUTTERS

As with the spreaders, the daily check on the cutters should be for its readiness and that the dust cap is in place.

The weekly check is also similar to the spreaders in that a good visual inspection is needed to ensure that all fasteners are present and secure

and the trigger handle operates correctly. The cutter should also be connected to the pump and cycled, paying particular attention inside the protective boot area for debris. Any foreign materials such as metal and glass that may have entered and become lodged in the yoke/pivot area may cause the cutters to operate improperly and potentially damage the tool. Most importantly, the hinge bolt nut needs to be checked for tightness. This can be done by hand to determine tightness. If bolt is found to be loose, remove cutters from service and fill out a maintenance request.

Also on a weekly basis, as well as after each use, the cutter blades shall be inspected for nicks, cracks and gouges. Because thousands of pounds force is exerted on the blades during cutting operations, all nicks and metal build up known, as “mushrooming” need to be dressed with a file so that blades may pass each other without any deflection. Any blade showing evidence of “mushrooming” or cracking shall immediately be taken out of service and a maintenance request submitted for repairs.

D. TELESCOPIC RAMS

The daily check is to include the ram’s readiness and that the dust cap is in place.

Weekly, a visual inspection of the carrying handle and all of its components should be performed as well as the ram ends for rotation. The ram ends should turn freely and swivel completely around. The trigger handle should also be operated to ensure proper operation. Extend the rams fully checking for gouges or sharp points that may damage the end seals and cause leakage. Another area to inspect is the small chrome tube that runs along the main body of the ram. This is a return tube and if bent or punctured, will leak hydraulic fluid under pressure.

E. HOSES

The daily check of the hoses consists of a visual inspection to ensure that the dust caps are in place and no fluid is leaking from the hoses.

Weekly, when operating the hand tools, check the coupler for proper operation by connecting the hose to the hand tool. The coupler should make a full connection and a noticeable “click” with a slight rotation. If the coupler doesn’t make a full connection it may need to be replaced. Ensure the couplers are free of debris or obstruction. If after several attempts you are unable to make a connection, fill out a maintenance request for repairs. Because these couplers are of a flat face, no-drip design, the tolerances are very tight and need to be kept free of all dirt and debris. The dust caps should always be wiped clean inside and out before placing them on a coupler.

Because the hoses are the most abused component of the Holmatro rescue tool system, i.e. stepped on, drug across the ground, pulled across sharp objects, the full length of the hose needs to be inspected for any cracks, holes, abrasions that may cause leakage if not replaced. During the tool operation check, hold the trigger handle to the full open or closed position for about 5-10 seconds and check for leaks along the hose and the couplers. Any leaking hose should be taken out of service immediately and replaced.

The hoses should be cleaned with a mild soap and warm water solution. If hoses become contaminated with grease, tar, battery acid or any other harmful product, a wiping cloth dampened with WD40 can be used to remove such products before cleaning with soap and water.

Additionally, hoses should be stored in a coiled roll and not shoved into the handle of the spreader or cutter. Even though the hoses are constructed of Kevlar-like Aramide fibers and polyurethane and will not hold a permanent bend, prolonged storage in the tool handle can cause slight deformities throughout the length of the hose. With the speed and ease of the single coupler design, there is no real advantage to keeping the tools pre-connected and stuffed into the handle.

G. FUEL MAINTENANCE

Holmatro uses Honda engines that have very small air ports and susceptible to clogging and gumming with contaminated or “sour” gasoline. The fuel stabilizer Sta-bil® should be added to all portable fuel cans when refilling to keep gasoline fresh. If unsure about your gasoline’s freshness dispose of properly and refill with fresh gasoline.

If at any time your Holmatro power unit runs rough or stalls when the choke lever is placed in the run position, fill out a maintenance request for repairs to the unit. Running the power unit in the half choke position for extended periods of time can cause damage to the engine components.

Because our Holmatro rescue tools are very crucial to the safe and timely extrication of persons trapped in vehicles, proper maintenance techniques shall be adhered to, thus ensuring that the tools will perform to their designed capacity.

III. SAFETY CONSIDERATIONS

The hydraulic tools used in the fire service today are capable of producing thousands of pounds of hydraulic pressure within the tool system as well as being able to exert thousands of pounds of external force. These forces, if not

managed correctly, are capable of inflicting bodily injury to both the rescuers and the patients that are trapped in the vehicles in which we are working on. The following points should be considered when operating with and around these hydraulic rescue tools.

 Be sure that all personnel using the tools are trained in the safe operation of such tools as per the manufacturer's owner's manuals and your company's SOGs.

 Proper maintenance of the tools will help to ensure their safe and efficient operation.

 Always wear proper PPE's such as helmet, goggles, gloves and protective clothing when operating the tools on an object.

 Allow only the necessary personnel in the work area during an extrication operation and ensure that they are wearing proper PPE's.

 When operating tools in an environment where flammable or combustible liquids and gases are present, a loaded 1 ½" hose line and dry chemical should be in place and ready to protect personnel in the work area.

 Always attempt to maintain good footing while operating the tools and avoid over-reaching that could cause a loss of balance.

 Most hydraulic tools are designed for one-person operation. Both the operator and personnel nearby should be aware of the tool as it is operating.

 Keep body parts away from the working end of the tool. The tools are extremely powerful and will not feel the resistance of flesh and bone.

 Avoid situations that place you, the operator, in between the tool and the vehicle. If you end up in this position, stop the tool and place yourself on the opposite or open side of the tool.

 Be aware of a rotating tool to avoid the possibility of pinching your trigger hand between the tool and the object you are working on.

 Avoid cutting objects that are not intended for the tool.

 When cutting an object blindly, such as a door hinge, pay close attention to the movement of the cutter. If the cutter twists or rotates excessively, stop and reposition cutter blades. Continuing to operate the tool when this condition exists could lead to blade damage or breakage, which could injure personnel.

 When lifting vertically with a spreader or ram, be sure to use cribbing as you are lifting to avoid the possibility of an object falling and injuring personnel or patients.